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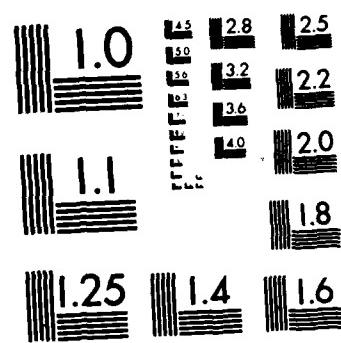
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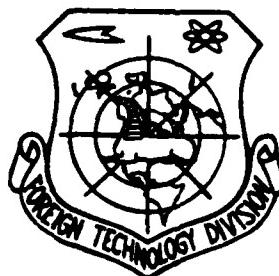
FOREIGN TECHNOLOGY DIVISION



INFORMATION SYSTEM FOR MANAGING THE TECHNICAL OPERATION
OF SHIPS AND PORT FACILITIES

by

Janina Sarol



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INFORMATION SYSTEM FOR MANAGING THE TECHNICAL OPERATION OF SHIPS AND PORT FACILITIES

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One of the basic problems of marine management is that of the technical operation of ships and technical facilities. The importance of this problem is indicated by the fact that the operational sphere in Polish marine economy is considered to have fixed assets with a value of around 72 billion zlotys, while the annual operating costs are around 8 billion zlotys, which is 11.1% of the value of the fixed assets. The high costs of maintaining the technical potential make it necessary to make joint efforts in this area of marine economy in order to improve the efficiency of management.

Some problems in the area of technical operation involve all of the operational facilities, both ships, and port facilities, namely:

- all facilities undergo three successive phases, i.e., design, creation and operation;
- two stages of utilization and service are distinguished in the process of the operation of facilities, depending on the conditions of fitness for operation and unfitness;
- physicochemical phenomena which occur during the process of operation have the same origin, but the intensity of their effect is different, depending on the method of operation and the environment in which the facility operates;

- the methods of organizing the work of the services for safe-guarding traffic and the source of materials are the same for a large group of facilities;
- the methods of planning operational tests and processing their results for individual groups of facilities and their components which are working in different branches are basically the same;
- methods of evaluating the limiting conditions are the same for large groups of facilities;
- information from the process of the operation of facilities regarding the extent of their utilization, the efficiency of service, the efficiency of conservative measures (oil and lubricants), and the stability and reliability of the facilities and their components are similar throughout the marine economy.

Thus, it is possible to conduct joint studies which encompass these problems in different marine economy establishments using the same theoretical principles.

The shipping and fishing enterprises are concerned with the operation of ships; of these enterprises, the Polish Ocean Lines [PLO] operated 175 ships in 1976, the Polish Steamship Co. [PZM] - 103 ships, the fishing establishment - 799 ships, whereas the port facilities are operated by the port administrations.

A suitable information system must exist in order for the system of technical operation of ships and port facilities to function normally. Since a large part of the information flow of the establishments of the marine economy has common characteristics, it permits the standardization of the system of management of technical operation. Such a system can be organized as a departmental system for managing the technical operation of ships and technical facilities in the marine economy, within the framework of which both the branch systems, and the systems of individual concerns or establishments can work. Thus, a system for managing the technical operation of ships and technical facilities in the marine economy (SKTE), with the detailed consideration of its information system, will be the object of further considerations.

This system can be defined as a set of elements and the relationships between them which are the most important from the standpoint of the stated goal, which is to optimize the effect of economic technical operation. The problem of the optimization of technical operation boils down to finding that operating method which will ensure that the maximum economic effect is obtained.

Good conditions for realizing the system's goals should be created by working for the specific goal. In the system in question, these conditions are expressed by functions grouped into six interrelated functional units (Fig. 1), for which the specific goals remained designated (see Table 1). With consideration of the departmental scope of the system, it is necessary to create a hierarchical structure of the management system (Fig. 2).

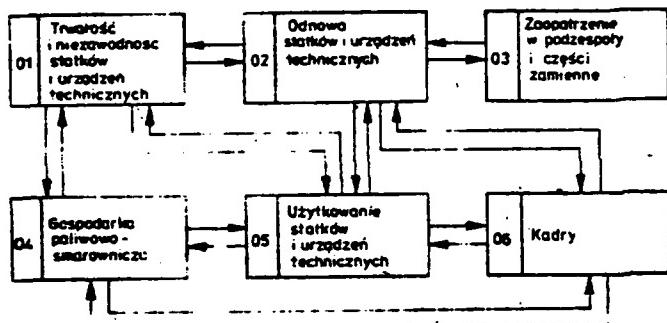


Fig. 1. Diagram of interrelationships of separate functional units.

KEY: (01) Durability and reliability of ships and technical facilities. (02) Renovation of ships and technical facilities. (03) Supply of subassemblies and spare parts. (04) Management of fuels and lubricants. (05) Utilization of ships and technical facilities. (06) Personnel.

Table 1. Goals and duties of system of management of the technical operation of ships and port facilities.

| No. | Functional units (subsystems or modules) | Specific goals | Duties | |
|-----|---|--|---|--|
| 1 | Durability & reliability | Improving the durability and reliability of facilities | Evaluation, analysis and estimation of facility durability and reliability indicators | |
| 2 | Renovation | Decreasing idle time for renovations and repairs | Estimating and studying the timetable and costs of the renovation process | |
| 3 | Supply of spare parts | Optimizing the reserves of spare parts on ships and on hand in land warehouses | Evaluation, analysis and estimation of the level and structure of spare parts on | Evaluation, analysis and estimation of technical costs |

Table 1 (cont'd).

| No. | Functional units (subsystems or modules) | Specific goals | Duties |
|-----|---|---|--|
| 4 | Fuels and lubricants | Optimizing the service life of fuels and lubricants | Evaluation and estimation of the service life of fuels and lubricants |
| 5 | Utilization | Broadening the utilization schedules of facilities | Analysis and estimation of the structure of the utilization process |
| 6 | Personnel | Rational management of personnel | Evaluation and estimation of size and structure of service and operating personnel |

Evaluation, analysis and estimation of technical costs

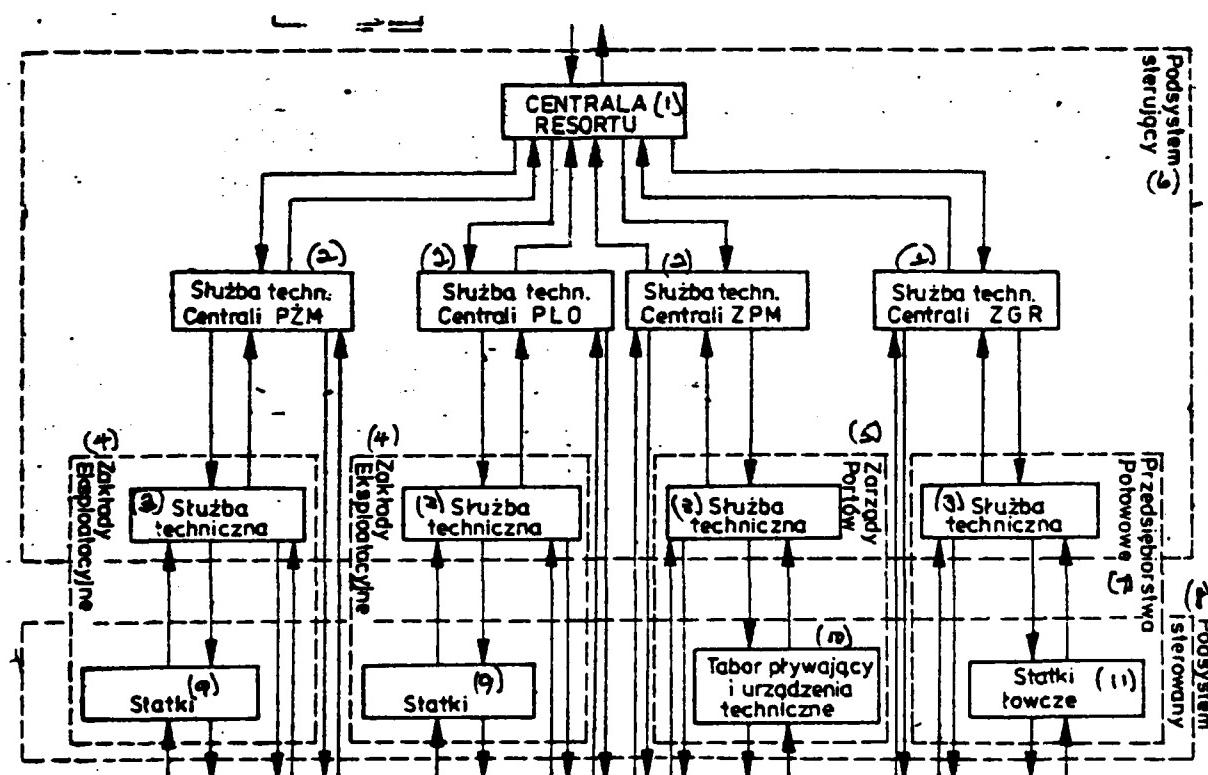


Fig. 2. Structure of information system. KEY: (1) Central office of department. (2) Technical service of central office of (3) Technical service. (4) Operational establishments. (5) Port administrations. (6) Control subsystem. (7) Fishing concerns. (8) Controlled subsystem. (9) Ships. (10) Floating stock and technical facilities. (11) Fishing ships.

The information system which has existed up to now in the area of the technical operation of ships and technical facilities, based on the traditional processing techniques, has become a serious obstacle to effective management in this area of the marine economy. The efficiency of management in this area can be improved by modernizing this system by computerization. The realization of the information systems in the area of technical operation which exist and are currently being planned in the branches of the marine economy cannot have a fundamental impact on improving the efficiency of the management of technical operation. The narrow material sphere, as well as the incoherence of the functioning systems, make it impossible to rapidly obtain the complex information which is essential to the correct realization of management functions. This information can only be provided by an information system which encompasses the whole realm of technical operation, taking into consideration the interdependence of the existing phenomena.

There are theoretical prerequisites which affect the possibility of constructing an information system for managing the technical operation of ships and technical facilities. The functional unit preferred in the system will meet the requirements of a similar subsystem or module of the information system.

Each of the preferred subsystems (modules) should realize a fundamental duty of the information system which meets the particular goal of the technical operation management system.

Thus, the goal of the present information system for the purpose of managing the technical operation of ships and facilities in the marine economy will be to quickly provide complex and reliable information used to make decisions at different administrative levels aimed at achieving the anticipated economic and technical effects.

Figure 3 shows a model of the information system for managing the technical operation of ships and technical facilities in the marine economy with the isolation of its information subsystem.

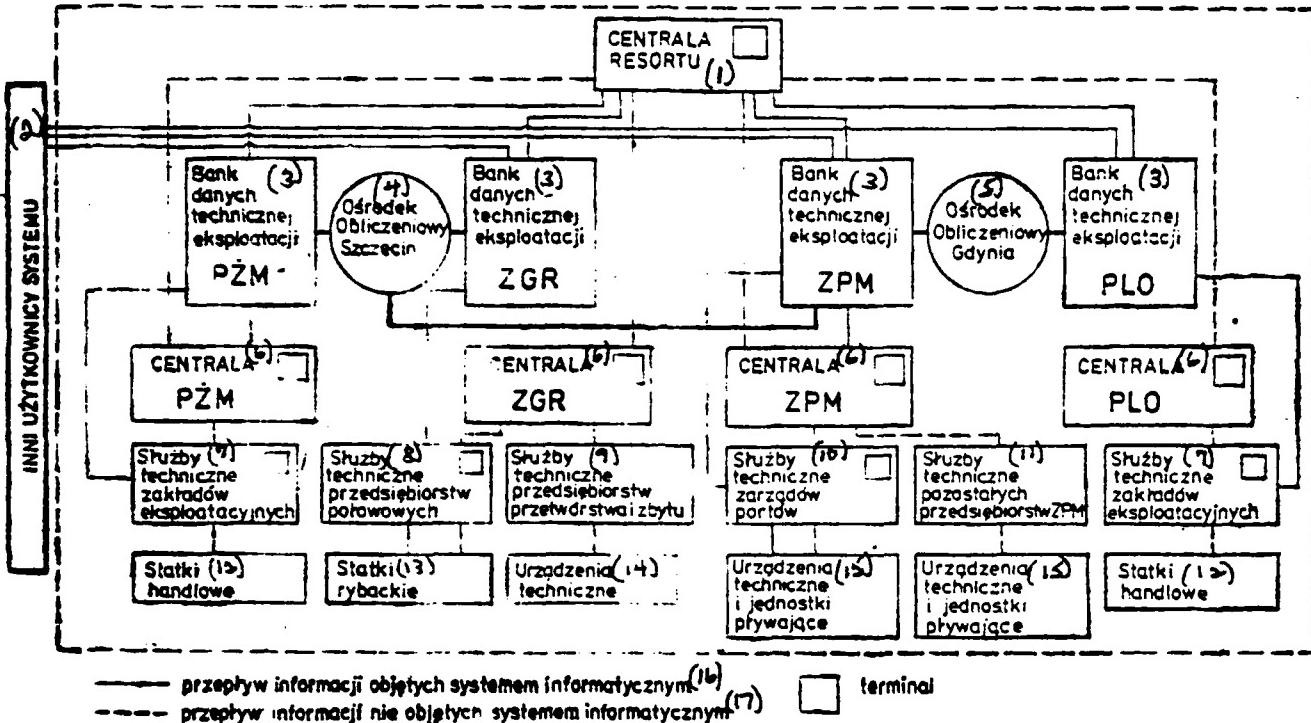


Fig. 3. Model of information system with isolation of information subsystem for managing the technical operation of ships and facilities in the marine economy (the creation of two separate data banks at Gdynia and Szczecin is planned).

KEY: (1) Central office of department. (2) Other uses of system. (3) Data bank for technical operation. (4) Szczecin computer center. (5) Gdynia computer center. (6) Central office of (7) Technical services for operational establishments. (8) Technical services for fishing enterprises. (9) Technical services for processing and sales. (10) Technical services for port facilities. (11) Technical service for remaining concerns of ZPM. (12) Commercial ships. (13) Fishing ships. (14) Technical facilities. (15) Technical facilities and floating stock. (16) Information flow encompassed by information system. (17) Information flow not encompassed by information system.

The information system in question should contain two interrelated fundamental components: the computer system and the data bank. The computer system should meet the requirements of all of the duties of an information computer system included in Table 1, while the data bank must accumulate and store the data necessary for these operations.

The basic components of the data bank should be: the data bank, the data bank control system, and the data bank language.

The system SIKTE should be described by the following characteristics:

- hierarchical structure, i.e., the system must make it possible to appropriately select the processed information;
- standardization in the area of the method of recording information concerning processes of the technical operation of ships and facilities of the same type in different branches, as well as enterprises and warehouses, making it possible to look for similarities;
- openness of structure, making it possible to gradually expand the data base, as well as the jobs which utilize this base, until the problems from the area of technical operation are solved.

The following requirements and limitations should be taken into consideration in the successive stages of designing the proposed information system:

- considering the currently prevailing method of administration, i.e., parametric, the data banks should be created on the central level of the WOG;
- in the first stage of planning work, it is planned to automate only that part of the information system which directly involves the control of the technical operation of transport and fishing ships and the technical facilities in marine ports;
- the central office of the department should receive information of standard content and form directly from the branch data banks, with the composition of information required by the GUS [Chief Central Statistical Office] being anticipated as the minimum composition of information;
- users outside the department, such as equipment manufacturers, shipyards, scientific research institutes, etc., will also be able to take advantage of the branch data banks; however, it will also be possible to transmit financial information for the GUS and the Planning Committee directly from the data bank or through the central office of the department.

The SIKTE system should become an integral part of the information system for department management.

The selection of suitable technical equipment which will meet the users' requirements is an important factor in obtaining an

effective information system for managing the technical operation of ships and technical facilities. Thus, we should also consider the following requirements for the realization of the system:

- the possibility of using the existing or planned computer base;
- the proposition of supplementing the existing equipment with new equipment which is necessary for the requirements of realization of the system.

Besides the MHZiGM [Ministry of Foreign Trade and the Marine Economy] in Gdynia, the organization of several regional computer centers is planned, namely, in Gdansk, Szczecin, Warsaw and Katowice. Two computer centers have been created for the needs of the port information system, namely, the existing computer center in Gdynia for the marine economy enterprises of the Gdansk-Gdynia region, and the computer center in Szczecin for the marine economy enterprises of the Szczecin region. These computer centers, equipped with computers with a relatively large computational capacity and supplemented with the appropriate imported equipment, such as communication processors, large disc storage units, etc., make it possible to simultaneously process information in multiaccess systems with wide access to the data transmission network.

Under these conditions, the following matters should be taken into consideration: data transmission from ships and outfitting the system users with terminals. Data transmission from ships is a problem which makes it necessary to conduct special studies, especially since its solution is necessary to ensure the efficiency of the information system for managing the technical operation of ships.

In order to meet the requirements of the planned system, it will be necessary to provide all of its users with intelligent terminals (minicomputer assemblies) and transmitting-receiving equipment. When selecting the types of terminals and their locations, one should be guided by: the scope and nature of the user requirements, the room in which the information originates (the data collection equipment should be closest to the data origination room), and the remoteness

of the users.

The general outline above constitutes the concept of the information system for controlling the technical operation of ships and technical facilities in the marine economy, and it can serve as the basis for further studies and planning work.

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